

Lucas Busta

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Professional Preparation

2016-... **Postdoctoral Research Associate** University of Nebraska-Lincoln (UNL)
2011-16 **Ph.D. Chemistry** University of British Columbia (UBC)
2007-11 **B.Sc. Chem., Biochem. & Molecular Biology** University of MN-Duluth (UMD)

Research

Research Training

2017 **Science Communication and Policy Bootcamp** (American Institute of Biol. Sci.) .. 7 hrs.
2017 **Metabolomics Workshop** (UNL Center for Biotechnology and Waters) 9 hrs.
2017 **Social Media and Communicating Science Workshop** (UNL) 2 hrs.
2017 **Workshop on Budget Development** (UNL) 2.5 hrs.
2017 **Write Winning Grant Proposals Seminar** (UNL) 7 hrs.
2016 **Bioinformatics for Evolutionary Biology** (UBC Biology 525D) 20 hrs.
2016 **R Carpentry Workshop** (UBC) 12 hrs.
2012 **Physical and Analytical Chemistry Seminar** (UBC Chemistry 540A) 24 hrs.
2012 **Principles of Chemical Separation** (UBC Chemistry 534) 72 hrs.
2011 **Bioanalytical Chemistry** (UBC Chemistry 533) 72 hrs.
2011 **Advanced Bioorganic Chemistry** (UBC Chemistry 569) 72 hrs

Research Experience

Collaborative / Team Research

2017-... **Asst. Prof. Dylan Kosma** (U. Nevada - Reno., USA)
2016-... **Prof. Yanjun Guo** (Southwest Agricultural U., China) [pubs. 6 & 8]
2015-... **Dr. Ulrike Bauer** (U. Bristol., U.K.) [pub. 11]
2015-... **Dr. Olga Serra Figueras** (U. de Girona., Spain) [pub. 10]
2015-17 **Prof. Yuelin Zhang** (U. British Columbia., Canada) [pubs. 3 & 7]
2012-... **Asst. Prof. Jessica Budke** (U. Tenn.-Knoxville, USA) [pubs. 1 & 2]

Postdoctoral Research

2016-... **Research area: Biosynthesis of unusual fatty acids and associated natural products**
mentor: Edgar Cahoon, Professor of Biochemistry, Center for Plant Science Innovation Director
- Performed *de novo* transcriptome assembly and differential expression analysis
- Heterologously expressed constructs in hairy roots, tobacco, arabidopsis, camelina

Doctoral Research

2011-16 **Research area: Diversity and biosynthesis of plant cuticular waxes**
mentor: Reinhard Jetter, Professor of Chemistry and Botany
- Performed detailed chemical analyses of hundreds of plant wax lipid extracts
- Chemically synthesized standards for structure elucidation and enzyme assay
- Performed comprehensive lit. review and biosynthetic analysis of plant waxes

Undergraduate Research

2008-11 **Research area: Custom data acquisition software design**
advisor: John Evans, Professor of Chemistry
- Developed custom data acquisition and processing software using LabVIEW

Teaching & Mentoring

Training in Education

2017	Teaching and Learning Council Workshop on Teaching Statements (UNL)	1 hr.
2016	Instructional Skills Workshop (UBC)	24 hrs.
2016	Writing Across the Curriculum Workshops (UBC)	7 hrs.
2015	Teaching Assistant Peer-Mentor Training (UBC)	6 hrs.
2011	Teaching Assistant Training (UBC)	12 hrs.

Teaching Experience

Guest Lecturer

2017	UNL Biochemistry 843: "The plant cuticle"	50 min. lecture
2017	UNL Biochemistry 843: "Membrane hemifusions"	50 min. lecture
2016	UBC Chemistry 319: "Practical skills for chemical research"	30 min. lecture

Professional Online Tutor and Lecturer

2016-...	Chemistry and Biology Tutor and Lecturer (OneClass.com); invited to be an online tutor and lecturer to help international students transition to the U.S. academic environment, study effectively, and graduate on time	2.2 million student base
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Teaching Assistant

2016	Analytical Chemistry Lecture (UBC)	90 students, 1 semester
2015	Analytical Chemistry Lab (UBC)	6–12 students, 1 semester
2013-14	Organic Chemistry Lab (UBC)	15 students, 2 semesters
2012-13	Analytical Chemistry Lab (UBC)	6–12 students, 2 semesters
2011-12	First Year Resource Centre (UBC)	5–10 students, 2 semesters
2009-11	Analytical Chemistry Lab (UMD)	20 students, 4 semesters

Skill Sets

Analytical and Organic Chemistry

Chemical Analysis

GC-EI-MS, GC-FID:	Advanced	... Lipid and amino acid metabolic profiling, structure elucidation
LC-ESI-MS(/MS):	Intermediate	... Lipid analysis

Organic Synthesis

Functionalized lipids:	Intermediate	... Basic reactions, work-ups, and product purification
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Biochemistry and Molecular Biology

Plant Molecular Biology

Plant crossing:	Intermediate	... Arabidopsis thaliana
Binary vector construction (Gibson Assembly):	Intermediate	... 1-2 gene overexpression vectors
Heterologous expression:	Intermediate	... A. thaliana, Camelina, hairy roots, N. benthamiana

Computational Biology and Computers

Bioinformatics

R scripting:	Advanced	... Statistical computing and graphics, bioinformatics, phylogenetics
bash scripting:	Advanced	... Statistical computing, bioinformatics
perl scripting:	Advanced	... Statistical computing, bioinformatics
Bioinformatics programs:	Intermediate	... Transcriptome assembly and analysis

Computer languages

Javascript (D3 libraries):	Intermediate	... Interactive visualization of complex datasets
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Git(hub), HTML, CSS: Intermediate *Website and blog design*
LabVIEW: Advanced *Custom data acquisition and processing*
LaTeX: Advanced *Professional typesetting and document generation*

Tools Developed

TREES in R: An R script tutorial for constructing and annotation phylogenetic trees in R
lucusbusta.github.io/resources/TreesInR.R

Elemental: A perl script for managing high-quality *de novo* transcriptome assembly using multiple existing assemblers in parallel (based on the method of Voshall et al.), BLASTing transcriptomes and acquiring public sequence data to analyze and visualize gene homology and expression patterns lucusbusta.github.io/resources/elemental.pl

Languages

2001-... **Fluent in Spanish (Castellano)** reading, writing, speaking

--- **Honors and Awards**

2017 **Postdoc Science Slam Champion:** (\$750) UNL
 2017 **ASPB Plantae Fellow** *American Society of Plant Biologists*
 2017 **F. & M. Loewus Travel Award:** (\$200) *Phytochemical Society of North America*
 2017 **Best Postdoctoral Poster Award:** (\$250) *Phytochemical Society of North America*
 2016 **F. & M. Loewus Travel Award:** (\$200) *Phytochemical Society of North America*
 2015 **Graduate Student Travel Award:** (\$500) UBC
 2013 **Best Oral Presentation Award:** (\$250) *Phytochemical Society of North America*
 2011 **Casmir Ilenda Award for Outstanding Undergrad. Research** UMD
 2011 **F.B. Moore Academic and Leadership Award** UMD
 2010 **ACS Undergraduate Analytical Chemist of the Year** *American Chemical Society*
 2010 **Maguire Award for Most Promising Chemistry Student** UMD
 2009 **Maguire Award for Most Promising Chemistry Student** UMD

--- **Academic Service and Outreach**

2017-... **Seminar Speaker Host** *Dr. Dylan Kosma at the UNL Biochemistry Seminar Series*
 2017-... **Ad hoc reviewer** *Plant Cell Reports*
 2017-18 **Volunteer** *Plantae(.org) Outreach Network Coordinator*
 2017 **Volunteer** *Sunday with a Scientist, UNL Science Museum, 4 hrs.*
 2017 **Volunteer** *NSF High School Teacher Workshop, UNL, 4 hrs.*
 2017 **Volunteer** *NSF Outreach Day, UNL, 3 hrs.*
 2017 **Volunteer** *Fascination of Plants Day, UNL, 3 hrs.*
 2017 **Volunteer** *Women In Science, UNL, 3 hrs.*
 2017 **Volunteer** *Graduate Student Spring Poster Fair Judge, UNL, 3 hrs.*
 2017-... **Member** *National Postdoctoral Association*
 2013-... **Member** *Phytochemical Society of North America*
 2017-... **Science communicator** *@PlantsRChemists: weekly twitter blog for the lay reader*
 2016-... **Science communicator** *Plants Are Chemists: monthly blog for the lay reader*

Publications

Peer-reviewed publications

- in review* [9] Yanjun Guo, **Lucas Busta**, Reinhard Jetter*. "Cuticular waxes from five fern species" *ANNALS OF BOTANY*
- 2017 [8] **Lucas Busta** and Reinhard Jetter*. "Moving beyond the ubiquitous: the structural diversity and biosynthesis of specialty plant wax compounds" *PHYTOCHEMISTRY REVIEWS*, *in press*
- 2017 [7] Tongjun Sun, **Lucas Busta**, Pingtao Ding, Reinhard Jetter, and Yuelin Zhang*. "Arabidopsis Transcription factors TGA1 and TGA4 regulate salicylic acid and pipecolic acid biosynthesis by modulating the expression of *SARD1* and *CBP60g*." *NEW PHYTOLOGIST*, *in press*
- 2017 [6] Yanjun Guo[†], **Lucas Busta**[†], and Reinhard Jetter*. "Composition of cuticular wax differs among organs of *Taraxacum officinale*." *PLANT PHYSIOLOGY AND BIOCHEMISTRY*, 115: 372-379
- 2017 [5] **Lucas Busta*** and Reinhard Jetter. "The structure and biosynthesis of branched wax compounds on *Arabidopsis thaliana*." *PLANT AND CELL PHYSIOLOGY*, 58(6): 1059-1074
- 2016 [4] **Lucas Busta**[†], Daniela Hegebarth[†], Edward Kroc, Reinhard Jetter*. "Changes in cuticular wax coverage and composition on developing Arabidopsis leaves are influenced by wax biosynthesis gene expression levels and trichome density." *PLANTA*, 245(2): 297-311
- 2016 [3] Pingtao Ding[†], Dmitrij Rekhter[†], Yuli Ding[†], Kirstin Feussner, **Lucas Busta**, Sven Haroth, Shaohua Xu, Xin Li, Reinhard Jetter, Ivo Feussner, Yuelin Zhang*. "Systemic Acquired Resistance Deficient 4 encodes a key enzyme for pipecolic acid biosynthesis." *THE PLANT CELL*, 28(10): 2603-2615
- 2016 [2] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter*. "Cuticular wax coverage on *Funaria hygrometrica* is similar to vascular plants, but wax composition differs between surfaces of the leafy gametophyte, calyptra, and sporophyte capsule." *ANNALS OF BOTANY*, 118(3): 511-22
- 2016 [1] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter*. "Identification of β -hydroxy fatty acid esters and primary, secondary-alkanediol esters in cuticular waxes of the moss *Funaria hygrometrica*." *PHYTOCHEMISTRY*, 121: 38-49

Manuscripts in preparation

- in prep* [10] **Lucas Busta**[†], Olga Serra[†], Ok Tae Kim, Marisa Molinas, Irene Peré, Reinhard Jetter, Mercè Figueras. "Three oxidosqualene cyclases from *Quercus suber* involved in cork wax production."
- in prep* [11] **Lucas Busta**, Reinhard Jetter, and Ulrike Bauer. "Fine-tuning of epicuticular wax crystal slipperiness in a carnivorous pitcher plant"
- in prep* [12] Ok Tae Kim, Yurry Um, Mei Lan Jin, Young Chang Kim, Kyong Hwan Bang, Daniela Hegebarth, **Lucas Busta**, Radu Racovita, Reinhard Jetter. "Transcriptomic Analysis of Methyl Jasmonate-Elicited *Centella asiatica* Leaves and Characterization of Multifunctional C-23 and C-28 Oxidases Involved in Centelloside Biosynthesis"

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Presentations

Oral Presentations

- 2017 **Lucas Busta** and Reinhard Jetter: "Digging for buried treasure in a chemical diversity database", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO
- 2015 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Cuticular waxes from the leafy gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, *BOTANICAL SOCIETY OF AMERICA*, Edmonton, AB
- 2013 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Hydroxy esters from the gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Corvallis, OR ‡
- 2011 **Lucas Busta**, Evan Anderson, John F. Evans: "Development of a Time Domain Reflectometry System for the Determination of Ice Formation on Road and Bridge Surfaces", Oral Presentation, *SPRING UNDERGRADUATE RESEARCH SYMPOSIUM*, University of Minnesota Duluth, Duluth, MN

Poster Presentations

- 2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Bioactivity, structure, and biosynthesis of polyacetylenes", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO ‡ §
- 2017 **Lucas Busta**, Evan LaBrant, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA RESEARCH & INNOVATION CONFERENCE: PREDICTIVE CROP DESIGN: GENOME TO PHENOME*, Lincoln, NE
- 2017 **Lucas Busta**, Evan LaBrant, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA SYMPOSIUM ON PLANT BREEDING*, Lincoln, NE
- 2016 **Lucas Busta**, Reinhard Jetter: "Structure and biosynthesis of branched cuticular wax compounds", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Davis, CA

Invited Oral Presentations

- 2017 **Lucas Busta** "Using R to construct and annotate phylogenetic trees." Guest seminar, *UNL DEPT. OF AGRONOMY AND HORTICULTURE R CLUB*, Lincoln, NE.
- 2017 **Lucas Busta** "Now is the most exciting time yet to be a (plant) scientist." NSF Outreach Program presentation, *THE UNIVERSITY OF NEBRASKA - LINCOLN*, Lincoln, NE.
- 2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Special seminar, *THE BOYCE THOMPSON INSTITUTE*, Ithaca, NY.
- 2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Special seminar, *THE CENTER FOR PLANT SCIENCE INNOVATION*, Lincoln, NE.

‡awarded

§presented in Spanish